tumors are formed, which ultimately cause the death of the patient. The organs which are usually attacked by such metastatic tumors are chiefly the liver, the lungs, pleura, intestines, kidneys, spleen, brain, etc.

In very rare cases sarcoma has been found to attack both eyes of the patient.

The development of sarcoma of the choroid is usually observed at an advanced age, yet it has also been found in very young individuals. It seems to be somewhat more frequent in males than in females. In a considerable number of cases its development may rightly be attributed to an injury.

Histologically, we find the choroidal sarcoma to be more frequently pigmented than unpigmented. The pigmentation varies considerably, however, even in one and the same tumor. The elements of the tumor are either round cells or spindle cells. The spindle cells seem to be prevalent in the unpigmented sarcomata. The round cells of the pigmented sarcomata (melano-sarcomata) are usually very large. The round-cell sarcomata are mostly very vascular. The spindle-cell sarcomata have gener-

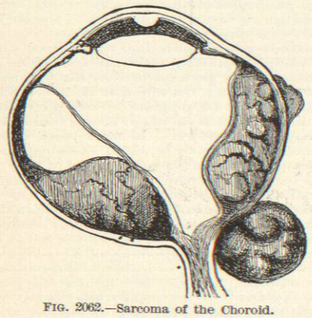

FIG. 2062.—Sarcoma of the Choroid.

ally but few blood-vessels, and in certain respects they present rather the characteristics of a fibroma. They also seem to grow more slowly than the round-cell sarcomata.

The sarcomata of the choroid may take their origin from the different layers of the choroidal parenchyma. The statement has been made, and its correctness has been denied, that the unpigmented spindle-cell sarcomata spring usually from the outer layers of the choroid. The writer is satisfied that this is the correct view, and that the pigmented sarcomata, especially the darkly pigmented ones, spring as a rule from the inner layers of the choroid. They get their dark pigment from the broken-up cells of the pigment epithelium, and from hemorrhages. Sarcomata starting from the outer layers of the choroid may remain perfectly unpigmented, and grow to quite a size, until by the final perforation of the lamina vitrea of the choroid, and the subsequent breaking up of the pigment epithelium, a large quantity of pigment molecules is set free, and then only does the tumor become to some extent pigmented. Before this happens the pigment epithelium is usually found in a state of proliferation.

Occasionally there may be more than one primary sarcoma nodule in the choroid of one eye. From the primary nodule the sarcoma spreads in the choroid in the following manner:

When the elements of the original tumor have perforated the lamina vitrea of the choroid, detachment of the retina may take place, or the retina may remain in contact with the inner surface of the tumor and become firmly adherent to it. The choroid surrounding the tumor, which at first may appear normal, or hyperæmic and slightly infiltrated, is gradually invaded by the elements of the tumor. This invasion takes place at first in the outer (venous) layers. In these cases the growth of the tumor is a more diffuse one. In other cases metastatic nodules are formed in other regions of the choroid, at some distance from the primary nodule. Gradually the elements of the tumor reach the lamina suprachoroidea, and the tumor soon adheres to the sclerotic. This union is sooner or later followed by the perforation of the sclerotic and the growth of secondary nodules on the outer surface of the eyeball. As stated before, this perforation of the sclerotic takes place along a pre-existing canal (nerve or blood-vessel) in the sclerotic. In rarer cases the cornea is perforated by ulceration, and thus the tumor spreads outside the eyeball. On the other hand, the tumor may spread backward by way of the optic nerve. This happens in one of the following ways: the elements of the tumor may invade the substance of the nerve itself, or they may enter into the porus opticus along the central blood-vessels, or they may invade the intravaginal spaces of the optic-nerve sheath. The glaucomatous symptoms, which are observed in most cases of choroidal sarcoma, are due to the pressure exerted by the growth.

The sarcoma of the choroid is sometimes found to contain deposits of amorphous lime.

In rare cases osseous tissue is found to have been developed within the sarcoma (osteo-sarcoma).

Chondromatous tissue is found somewhat more frequently (chondro-sarcoma). It usually appears in the shape of round or oval islets, which are generally surrounded by a tough connective-tissue capsule, and lie near or around a larger blood-vessel.

In a few of the cases observed the sarcoma was a cystic sarcoma, and in another small number it was an alveolar sarcoma.

The spindle-cell sarcomata are, as a rule, hard and tough, while the round-cell sarcomata are softer, sometimes even semifluid.

In a few cases metastatic carcinoma has been seen in the choroid of women, the primary growth having its seat usually in the mamma. In a man the seat of the primary tumor was in the lungs and pleura. In one case a metastatic sarcoma was found in the choroid.

From the foregoing it is evident that, as soon as the diagnosis of choroidal sarcoma is made, the eye should be removed, as it is impossible to state when the tumor will spread outside the capsule of the eyeball, although this usually takes place only at a late period.

VIII. TUMORS OF THE RETINA.—A. *Benign Tumors of the Retina.*—*Teleangiectatic tumors* and small *fibromatous tumors* have been occasionally found in eyes examined anatomically, but they do not seem to have ever been observed during life, nor are they of any importance.

B. *Malignant Tumors of the Retina.*—The only malignant tumor observed to take its origin from the retinal tissue is the *glioma* of the retina.

Glioma of the retina (fungus hæmatodes) is essentially a disease of childhood; the oldest patient in whom it was undoubtedly observed was but twelve years old. It is probably, in most cases, a congenital affection.

As with the sarcoma of the choroid, we may divide the clinical history of the development of a glioma into three periods.

In the first period the growth causes but slight outward symptoms, and its existence at this period is but seldom discovered. The first symptoms, on account of which the parents bring the child for examination, are usually diminution or total loss of sight and the observation of a light yellowish or yellowish-red reflex from the pupil (amaurotic cat's eye). In this stage the pupil is also generally found to be dilated, probably from paralysis of the nerves of the iris.

The reflex from the background of the eye may at first be visible only in certain parts, and then the ophthalmoscope may reveal only a partially swollen retina, and the optic papilla may as yet be visible. Gradually the background of the eyeball is shifted more and more forward in the vitreous chamber, and it may now be possible to see different round nodules by the aid of oblique

illumination. On the anterior surface of this yellow nodular mass a number of blood-vessels may be visible. Usually some whitish spots are seen, which correspond to parts which have undergone fatty degeneration, or to deposits of lime. Finally, the whole of the vitreous chamber is filled, and the tumor reaches the crystalline lens and presses it forward. This is usually soon followed by the formation of cataract.

Before this stage is reached, as a rule, the second period has begun, which is characterized by an increased

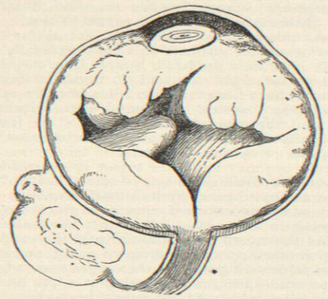

FIG. 2063.—Glioma of the Retina.

intra-ocular tension, pain, and inflammatory symptoms. The eyeball is now frequently ectatic in the equatorial region; there is iritis, and soon the cornea ulcerates and is perforated. The blood-vessels of the conjunctiva and episcleral tissue are hyperæmic and tortuous. These symptoms are often combined with cerebral ones; there may also be fever and vomiting. The ulceration and perforation of the cornea, in rare cases, may be followed by the formation of scar tissue and shrinkage of the eyeball. Such cases have been described as cases of spontaneous healing of glioma; but even after a considerable period of latency the tumor makes its appearance again, and thus valuable time may have been lost.

The third period is that of perforation. The glioma grows outward usually after the perforation of the cornea, —more rarely after perforation of the sclerotic. If it grows out through the cornea it increases very rapidly in size. The soft, easily bleeding, often partially necrosed tumor soon protrudes between the eyelids, and may in a short time attain an enormous size.

When the tumor has spread through the sclerotic, before the cornea has been perforated, the episcleral tumor or tumors may cause a considerable degree of exophthalmus. The tumor may furthermore invade the optic nerve and thus grow backward toward the chiasma.

Usually during this period secondary tumors are formed in the lymphatic glands of the face, in the parotid or submaxillary glands, in the bones of the skull, in the brain, in the liver, and in other organs.

Death follows from exhaustion.

In a large proportion of the cases (eighteen per cent.) glioma of the retina attacks both eyes. The affection of the second eye seems, however, not to be due to an infection from the one first attacked. Frequently several children of one family suffer from this new formation. It seems that it is more frequently found in males than in females.

The writer has reported one case in which glioma of one eye gave rise to sympathetic disease in the fellow eye.

In a few cases purulent choroiditis, with purulent hyalitis (pseudo-glioma), has been confounded with true glioma. In such cases, however, the intra-ocular tension is, as a rule, reduced, and pain seems to be wanting.

Moreover, the eyeball appears rather shrunken than distended, as it does in a case of true glioma.

The opinion formerly held by the writer, in common with numerous authors, that histologically considered the glioma (or glio-sarcoma) of the retina must be counted among the small round-cell (medullary) sarcomata seems no longer tenable, since the characteristic "spider cells" of the glia have by Golgi's and Ramon y Cajal's process been demonstrated in glioma tissue. Besides these characteristic glia cells the elements of the tumor are round cells, smaller or larger than white blood cells, or identical with them. Sometimes these cells have small offsets. Between them we find free nuclei and some spindle cells. There is a very small quantity of intracellular substance. The tumors are usually very vascular, and their blood-vessels are very wide. The cells seem to be very prone to degenerate. Rosettes, formed by the rods and cones, have been given of late an undue importance in the histology of glioma. In the opinion of the writer they are purely accidental formations. Tumors in which they were found have of late been called neuro-epitheliomata, these cells belonging to the so-called neuro-epithelium of the retina.

The tumor usually takes its origin from the outer retinal layers, especially the granular layers; in rarer cases its primary seat is in the inner layers, especially the nerve-fibre layer. In some cases it appears as if the whole thickness of the retina had been primarily affected, and, in fact, the tumor may take its origin from the connective tissue of all the layers of the retina.

As already stated, the glioma cells are apt to undergo fatty degeneration, and deposits of lime are often found in these tumors.

When the tumor starts from the outer layers (*glioma exophytum*), the retina in its neighborhood soon becomes detached and is pressed toward the axis of the eyeball. In these cases the inner layers of the retina may remain intact for a long time. On the other hand, when the tumor has started from the inner layers (*glioma endophytum*), the rods and cones may be preserved for a long period. The tumor gradually spreads all over the retina, and enters the choroid either simply by continuous growth or by infection (metastasis). During the growth of the tumor, parenchymatous hemorrhages frequently take place within it. Later on, the tumor may spread into the ciliary body and the iris, and we may thus find an eyeball filled perfectly by glioma, and but few traces of its former structures left.

At a comparatively early period, usually, the elements of the tumor invade the substance of the optic nerve.

The perforation of the sclerotic, and the formation of secondary tumors outside of it, generally take place along a preformed channel (nerve or blood-vessels), as

FIG. 2064.—Myxo-sarcoma of the Optic Nerve.

we have seen it take place in the development of the sarcoma of the choroid.

Glioma is known to be pre-eminently a malignant growth; therefore the removal of the eyeball, or even of the whole orbital contents, is necessary at the earliest possible period. In this way the life of the patient has been saved in a number of cases.

IX. TUMORS OF THE OPTIC NERVE (ORBITAL PORTION).—The tumors of the orbital portion of the optic nerve have a number of symptoms in common, whatever the nature of the growth may be, the chief ones of which are loss of sight and exophthalmus. The latter is often

the first symptom to be observed. This exophthalmus is, as a rule, in a straight forward direction, yet there may also be a deviation in another direction, if the tumor should develop more rapidly to one side. The eyeball can usually be moved, but its movements are restricted in all directions; later on, they may be totally abolished. If the tumor is large enough to be palpated, it is found to move with the movements of the eyeball, and to be nowhere attached to the orbital walls. When it is small it cannot be felt. In a number of cases the development of the tumor is attended with severe pain; in most cases, however, this symptom is wanting. In all cases sight gradually fails. In the early stages the ophthalmoscope reveals optic neuritis; later on, we find white atrophy of the optic nerve. The rapidity with which sight is abolished varies considerably in the different cases, and this is, of course, due to the manner in which, in the given case, the nerve itself is constricted or invaded by the elements of the neoplasm. Thus, when the tumor originates in the outer sheath, sight will be preserved longer than when the new formation has its origin in the perineurium or the substance of the nerve itself. As the tumor grows and pushes the eyeball out of the orbital cavity, the cornea becomes less and less protected by the lids, and finally this membrane ulcerates and is perforated.

It seems that in all the known cases, except one, the tumor with the eyeball, or the tumor alone, has been removed and a perfect cure has been obtained. From this it would appear that tumors of the optic nerve, *quoad vitam*, are not to be considered malignant.

As regards the nature of the tumors of the orbital portion of the optic nerve they seem to be chiefly myxomatous (myxo-sarcomatous) or gliomatous; in some cases the tumors had to be interpreted as endotheliomatous (psammoma), and a few cases, described as cancers of the optic nerve, most probably belong to this latter class. In one case the tumor was found to be a true neuroma. In a few cases the tumor has been described as being formed by a hypertrophy of the pia mater trabeculæ which hold the nerve-fibre strands in position.

Being enclosed within the space which is limited by the muscles of the eyeball, and the posterior aspect of the sclerotic, all of these tumors are more or less spindle-shaped (see Fig. 2064).

1. *Myxoma* or *myxo-sarcoma* of the optic nerve consists of spindle-shaped and stellated cells, with long offsets. These cells are usually packed more densely in the central parts of the tumor than in the peripheral ones. They are separated from each other by a hyaline intercellular substance. The cells often appear concentrically arranged, and thus form nests which resemble the pearl nodules of epitheliomatous neoplasms. These tumors are, furthermore, well provided with blood-vessels. The mucoid substance is often found to be accumulated in cysts of varying dimensions. Closely adherent to the new formation are the sheaths of the optic nerve, which form a capsule around it. Sometimes some traces of the optic nerve may yet be found in the centre of the tumor.

2. *Glioma* (glio-sarcoma) of the optic nerve shows the same elements as we find in cases of glioma of the retina, viz., round cells varying in size, cells with offsets, and spindle cells.

3. *Endothelioma* (psammoma) of the optic nerve consists of connective tissue, in the alveoli of which cells lie embedded in more or less concentric layers. These cells are large, flat, membrane-like bodies, somewhat thicker at the spot where the nucleus is situated. Their contours are not sharply defined, and some of them have long offsets. Giant cells are not wanting. These cells, the nature of which is that of endothelial cells, are often grouped concentrically around a round or oval shining body (arenoid body), from which these tumors have also received the name of psammoma.

4. In the only case of true *neuroma* of the optic nerve thus far described in literature, the whole egg-shaped tumor consisted of double-contoured as well as of non-medullated nerve fibres.

X. Tumors of the Orbit.—The chief symptom of orbital tumors, and the one which they all have in common, is exophthalmus—protrusion of the eyeball. This protrusion may, of course, take place in any direction, and we can only state, as a general rule, that it is in a direction opposite to the site of the tumor or to its greatest development. Usually the movements of the eye in the direction toward the tumor are impaired or abolished. While some orbital tumors cause a great deal of pain, others do not seem to cause any. According to the seat and size of the tumor, sight will be more or less impaired or totally destroyed, and we find accordingly, with the ophthalmoscope, simple anæmia or optic neuritis or atrophy of the optic nerve either partial or total.

Orbital tumors do not seem to be apt to invade the optic nerve, or the eyeball, but they generally grow around it. On the other hand, tumors from the cavities adjacent to the orbit may and do invade this cavity. Such tumors have been found to come from the ethmoid cells, the naso-pharynx, the frontal sinus, Highmore's antrum, and the sphenoid cavity, as well as from the cranial cavity. These growths are sarcomatous, endotheliomatous, or osseous in character.

As a rule, one may locate the tumor by palpation, and it is possible to distinguish one of orbital origin from a tumor of the optic nerve by its situation outside of the cone formed by the external muscles of the eyeball, and by its being in many cases adherent to the walls of the orbit. As the tumor (and consequently the exophthalmus) grows, the upper lid is dragged along, and it often continues to protect perfectly the cornea even when the eyeball protrudes to an enormous degree. The lid is then in the condition which we call paralytic ptosis.

When the lid can no longer protect the cornea, ulcerations take place, and perforation of the cornea may be the result. According to the nature of the tumor it may, of course, invade the brain, and cause metastatic tumors to be formed in other organs, and thus bring about the death of the individual. When the orbital tumor cannot be easily removed without detriment to the eyeball, Kroenlein's osteoplastic method should be employed.

A. *Benign Tumors of the Orbit.*—1. *Cysts* of the orbit have been designated, according to their contents, as hygroma, meliceris, oil and fat cysts, and atheromatous, hæmatomatous, or steatomatous cysts. They all are probably congenital and *dermoid* in character, and owe their existence to faulty development during fœtal life. This is the more probable, since some of the cysts have been found to contain a tooth, or hair, or other epithelial formations. In many of the cases the cysts were distinctly known to have been congenital, and in another number they were observed in small children. There is usually but one cyst, although in some cases several have been found. Their size varies considerably. They lie mostly outside of the cone formed by the external muscles of the eyeball, and seem to be situated more frequently in the temporal parts of the orbit than in any other region. They may extend far back into the orbital cavity.

These tumors increase but slowly in size, unless stimulated to a more rapid development by an injury, and they do not give the patient much discomfort until they are large enough to cause exophthalmus and displacement of the eyeball, which is, of course, in the direction opposite to the growth. They now may generally be seen as bluish swellings in the lid (generally the upper one), and may even be directly demonstrated by eversion of the lids. It may be possible to detect fluctuation in the tumors, yet this can hardly be done with any degree of satisfaction, and it is therefore better to make sure of a correct diagnosis by the use of an aspirator.

Cysts of the orbit seem to be equally frequent in both sexes, and have mostly been observed in young people.

2. *Angiomata* of the orbit are either cavernous or teleangiectatic (erectile tumors).

a. The cavernous angioma of the orbit, which can attain a very considerable size, is either congenital or develops in later years. It is usually situated in or starts from the fat tissue within the cone formed by the external

muscles of the eyeball. The tumor is often surrounded by a tough capsule of connective tissue. It may, as a rule, be seen as a bluish swelling under the skin of the lid, and from this similarity with orbital cysts mistakes in diagnosis have occasionally occurred. A characteristic symptom of the angioma is, however, that everything tending to hinder the reflux of the venous blood will cause a swelling and protrusion of the angioma; furthermore, the tumor may be compressed and emptied. The growth of the tumor is slow, and it is not apt to cause any pain. In rare cases a spontaneous cure has been observed. The removal of the tumor is practicable, and the more readily so the earlier it is undertaken.

β. The teleangiectatic tumors of the orbit are usually found to be accompanied by similar tumors in the lids and neighboring tissues, and they also form soft, compressible swellings. This kind of angioma seems to grow more quickly than the cavernous angioma. It is desirable that the growth should be removed at an early period.

3. *Lipoma* of the orbit has been described a few times. Yet it seems that in these cases the lipoma originally involved the eyelid.

4. *Enchondromatous tumors* of the orbit occur but rarely, if at all. The descriptions of such tumors thus far laid down in literature are, to say the least, doubtful.

5. *Osteoma* of the orbit has been often observed. It takes its origin from the diploë of the walls of the orbit. It is generally an ivory exostosis, sometimes partially spongy or cartilaginous. Its seat of predilection seems to be the upper inner wall of the orbit. In some cases osteoma has been found to develop symmetrically in both orbits of the same individual. These osteomata are usually round tumors, hard, and with a smooth or nodulated surface, and are mostly attached to the underlying bone by a broad basis. Their growth into the orbits may take place simultaneously with the growth of similar tumors into the neighboring cavities, or they may originally have started in one of the neighboring cavities and from there have grown into the orbital cavity. Their growth is most likely due to some faulty development during fœtal life.

Such tumors grow very slowly; in some cases their development is accompanied by pain. They may cause exophthalmus with all its sequelæ. When superficial, they are easily recognized by their seat, and by their consistency and immobility. It has, however, happened that retention cysts pointing into the orbit from a neighboring cavity, have been mistaken for osteomata. The tumors under consideration may have to be removed on account of their danger to the eyeball and its functions. Their removal is sometimes comparatively easy, yet it may be attended with danger from subsequent meningitis.

Histologically these tumors are found to consist of bone tissue. In most cases this tissue was found to be extremely compact and to be almost bare of Haversian canals (ivory exostoses). In other cases they contained varying quantities of marrow.

6. *Lymphoma* and *lymphadenoma* of the orbit have been described, but they took their origin probably not from the orbital tissue proper. Lymphangioma has also been found in the orbit.

7. Benign tumors consisting of striated muscular fibres and nerve fibres have in a few instances been removed from the orbit. The writer has seen a *rhabdo-myoma* and a *myo-neuroma* of the orbit.

B. *Malignant Tumors of the Orbit.*—1. *Cancer* of the orbit has been described as epithelioma, cancroid, adenoma, and adeno-carcinoma. It seems, however, that such new formations do not take their origin from the orbital tissue, but, having originated in the tissue of the eyelids, the episcleral tissue, or the lachrymal gland, have gradually invaded the tissues of the orbit. It is, therefore, not probable that a primary cancer of the orbital tissue has ever been observed.

2. *Sarcoma* of the orbit has frequently been observed and described. Its clinical diagnosis is extremely difficult, since we have but scanty means on hand wherewith to distinguish the nature of a tumor which has its seat in the deeper parts of the orbit. When the nature of the tumor is recognized, its removal with or without the simultaneous removal of the eyeball is, of course, imperative. Sarcomata have their origin usually in the orbital tissue. In a few cases the tumor had started in the brain and secondarily invaded the orbit. There are cases in which such an invasion takes place more or less symmetrically in both orbits.

A variety of forms of sarcoma have been described.

α. Cylindroma, a form of sarcoma characterized by a system of wide, anastomosing canals with larger cyst-like cavities filled with fluid, or gelatinous or fibrinous contents, has but very rarely been found in the orbital tissue.

β. Myxo-sarcoma of the orbit has been observed in about a dozen cases. These tumors were seen more frequently in children and young individuals than in older ones. In some their growth was a very rapid one, and in some it was accompanied by severe pain. The tumors consisted of long spindle and stellate cells, with a mucoid intercellular substance.

γ. Round-cell and *spindle-cell* sarcomata are the most frequent ones among the orbital sarcomata. In some cases they are melanotic.

δ. Osteo-sarcoma of the orbit always springs from the bony walls of this cavity. It seems to spring most often from the inner upper part of the orbital wall. It is usually a small round-cell or spindle-cell sarcoma, with spicula of bone tissue embedded in it. These spicula of bone tissue may be very numerous, and make the tumor appear very hard to the touch.

ε. The writer has recently examined and reported the case of an orbital tumor, which was situated over the nasal wall of the orbit and which proved to be a *myo-fibro-sarcoma*. The elements of which it consisted were very numerous unstriped muscular fibres and bands of denser fibrous tissue; in some parts giant cells and spicula of bone were situated.

3. Another form of malignant growth found in the orbit is that known as *chloroma*. It consists of small round cells undergoing a peculiar fatty degeneration accompanied by a greenish-brown color. It springs from the periosteum. Probably it is also a sarcoma.

XI. Tumors of the Lachrymal Gland.—The tumors of the lachrymal gland may be diagnosticated by their situation in the outer upper part of the orbit, and by the consequent exophthalmus inward and downward (at least at the beginning of the development). These tumors generally grow but slowly. Gradually they cause a bulging of the upper eyelid, most marked near the outer canthus, and it is, as a rule, now possible to palpate the tumor, or even to see it protruding into the conjunctival sac, pushing the upper fornix downward. By palpation a tough, lobulated swelling is felt, which may be slightly movable; in most cases, however, it is immovable. When the tumor grows it often fills the posterior parts of the orbit, and thus it may cause the exophthalmus to change its direction, and when the tumor has filled the apex of the orbit altogether, and has grown around the optic nerve (which tumors of the lachrymal gland never seem to invade), the eye may stand straight forward, as if there were a tumor of the optic nerve. For this reason the movements of the eyeball, which at first are restricted only in an upward and outward direction, may become, later on, restricted in other directions too, and even finally be totally abolished. If the tumor grows still further, ulcerations of the cornea, etc., may take place. During the development of such a growth, the optic nerve is, of course, considerably pressed upon and stretched, and accordingly we find it anæmic, or swollen and inflamed (optic neuritis), or atrophied. From the state of nutrition in which the nerve is when the tumor is removed, it will depend how far sight may be recovered. This removal may frequently be accomplished without sacrificing the eyeball.

Tumors of the lachrymal gland are usually observed in individuals of an advanced age, and their origin is some-

times attributed to an injury. Sometimes the lachrymal glands of both orbits in one individual have been found to be similarly affected. The tumor may, by entering the cavity of the brain and the brain substance, cause the death of the patient.

Various forms of tumors of the lachrymal gland have been observed, but opinions differ very considerably with regard to what may be considered a tumor of the lachrymal gland and what not.

The writer has seen and examined the following forms of tumors, which unquestionably took their origin from the lachrymal gland.

1. *Adenoma* of the lachrymal gland shows the typical picture of an epithelial neoplasm. Epithelial-cell cylinders, which compose the bulk of the tumor, lie embedded in a small quantity of connective tissue. The cells of every one of these cell cylinders are arranged around a central canal, which in some cases is very considerably enlarged by a transparent fluid. The cell cylinders are made up of one layer of polyhedral, almost cuboid epithelial cells, and have a distinct membrana propria.

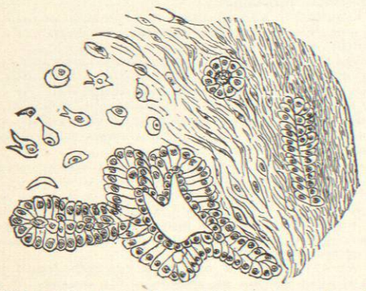

FIG. 2065. — Enchondroma Myxomatodes Carcinomatodes of the Lachrymal Gland.

The lachrymal gland has also, in a number of instances, been the seat of *adeno-carcinoma*, of *lymphoma*, and of *lymphadenoma*.

2. *Myxoma* and *myxo-sarcoma* of the lachrymal gland are characterized by the development of spindle cells with long offsets, and stellate cells embedded in a mucoid intercellular substance, and by the gradual disappearance of the glandular structure. This kind of tumor of the lachrymal gland is, however, but seldom observed alone. It is more frequently the case that the glandular tissue does not disappear, but, instead, an atypical growth of tissue takes place, at least in some parts of the tumor, and thus gives to it the character of an adeno-carcinoma. In some cases we find, moreover, besides these two kinds of new formations, a number of islets of hyaline cartilage tissue. Thus, instead of a simple myxoma or myxo-sarcoma of the lachrymal gland, we have then a myxoma carcinomatodes, or a myxoma carcinomatodes chondromatodes. In other cases the hyaline cartilage may be the prevailing tissue; in which case we would have to call the tumor an enchondroma myxomatodes carcinomatodes.

3. *Spindle-cell sarcoma* of the lachrymal gland has been described by a number of writers. In one of my own cases the tumor developed quite rapidly, and consisted of densely packed spindle cells in its older portions. The younger portions of the tumor showed round cells and small spindle cells. Not a trace of glandular tissue was found.

4. *In lympho-sarcoma* of the lachrymal gland the bulk of the tumor consists of densely packed lymphatic cells, with hardly any intercellular substance.

5. *Epithelioma* of the lachrymal gland is formed when an atypical growth of the epithelial elements of the glandular tissue takes place. We find, then, instead of the glandular apparatus, solid epithelial-cell cylinders and nests of epithelial cells. This form of growth seems, however, generally to be combined with the development of myxomatous tissue in the lachrymal gland. The cases described as epithelioma of the lachrymal gland should probably with more correctness be regarded as cases of adeno-carcinoma.

6. In the older ophthalmological literature, a number of cases of *cystic degeneration* of the lachrymal gland, or its ducts, have been described as *dakryops*. These cysts grew very slowly, and had to be removed on account of their impairing the motility of the eyeball. It is not known whether the whole of the lachrymal gland is likely to undergo such a change.

XII. TUMORS OF THE LACHRYMAL CARUNCLE.—The lachrymal caruncle is sometimes the seat of a new formation. Thus, congenital dermoid tumors have been observed in this region. Papillomata are not rare.

In advanced life the caruncle may become the seat of epitheliomatous new formations as well as of sarcoma. The latter kind of tumors are usually pigmented. The development of these tumors is almost always attributed to an injury.

XIII. TUMORS OF THE LACHRYMAL DRAINAGE APPARATUS.—In rare cases small *granulomata* (polyps) have been found in the lachrymal sac, and even in the lachrymal canaliculus. It is obvious that such little tumors may gain some clinical importance by the stoppage of the canals through which the tears ought to be carried off. Their formation is due to chronic inflammatory conditions of the mucous membrane of these channels.

Adolf Alt.

EYELIDS, AFFECTIONS OF THE. — The eyelids present two surfaces, both of which are subject to disease. The posterior, or under surface, *i.e.*, the surface which is in contact with the eye, is covered with conjunctiva, and affections of this surface are described under this head. (Cf. *Conjunctiva, Diseases of.*) In describing the affections of the eyelids we have to consider the anterior or upper surface, and the structure between the two surfaces.

The upper surface of the eyelid is covered with integument which is continuous with the integument of the forehead and face. It differs from the integument of the forehead and face in being thinner. Under the skin of the eyelids we find the subcutaneous areolar tissue, which frequently becomes infiltrated with effusions, and distended with air in injuries to the nose and air sinuses. The next tissue is the orbicularis muscle, the function of which is to close the eyelids. This is the muscle which is affected in paralysis of the facial nerve, producing inability to close the eyelids, or, as it is sometimes called, lagophthalmus. Beneath this muscle are the tarsal cartilages, upper and lower, the functions of which are to add to the protection of the eye, to preserve the contour of the lids, and, in the upper lid, to give attachment to the muscle which raises the lid—the levator palpebræ superioris.

The tarsal cartilages contain in their substance the Meibomian glands, whose sebaceous secretion lubricates the edges of the lids. The tarsal cartilages are thicker at the free margins of the lids, and gradually taper back to a thinner edge; they are about one inch in length. The upper cartilage is about one-third of an inch in breadth at its centre, and narrowing toward its outer and inner extremities has a somewhat semilunar shape. The cartilage of the lower lid is much smaller in width, having a more or less elliptical shape. The free margins of the upper and lower lids—*i.e.*, the edges where the anterior or cutaneous surface and the posterior or conjunctival surface meet—lie in contact with each other when the eye is closed, and contain the cilia, or eyelashes, together with the openings of the ducts of the Meibomian glands. The extremities of the margins of the upper and lower eyelids are joined together, and are called the outer canthus and the inner canthus.

These canthi, with the extremities of the cartilages,

are attached to the frontal processes of the superior maxillas at the inner sides, and to the malar bones on the outer sides, by the canthal ligament. It is important to bear this in mind in operations on the outer canthi especially.

The inner canthi are shaped somewhat like horseshoes, and at the free extremities of the shoes are the openings of the lachrymal canals, the puncta lachrymalia. Under the tarsal cartilages is the palpebral portion of the conjunctiva.

The eyelids are subject to diseases affecting the integument generally, as well as to affections peculiar to themselves, because of the structures involved.

The departures from the normal which may affect the cutaneous surfaces of the eyelids, either separately or in common with the skin of the forehead and face, are, erysipelas, exanthemata, ecchymoses, herpes, œdema, emphysema, venereal sores, eczema, and acne.

Erysipelas and exanthematous diseases seldom, if ever, attack the eyelids except as they affect the cutaneous surface generally. Erysipelas is never confined to the integument of the eyelids alone, except that the attack may originate in this situation and spread to other parts. Its restriction to the eyelids, under these circumstances, would be only temporary, lasting, at most, not more than forty-eight hours. The writer has seen a patient attacked with what appeared at the onset to be a purulent conjunctivitis, with eyelids red, swollen, and œdematous, together with a moderately profuse purulent discharge from the conjunctiva, develop in less than thirty-six hours into a case of facial erysipelas, the eye symptoms subsiding as the disease spread over the face. There are none of the exanthemata in which the eruption manifests itself first about the eyelids, and when the eyelids are involved it is only as a part of the general cutaneous involvement. Eczema may manifest itself on the eyelids as the result of a general facial condition, or may be secondary to the inflammatory condition of the edges of the lids known as blepharitis; of this we will speak later.

Acne may also affect the eyelids as the result of a general cutaneous affection.

The treatment of these general inflammatory affections of the integument of the eyelids does not differ from the treatment of the same disease when located elsewhere in or on the cutaneous surface. It may be necessary to be cautious in the employment of lotions, embrocations, and ointments, containing irritating substances, because of the danger of injuring the delicate structure of the eye itself, but other than this the treatment of affections of the lids, such as we have mentioned, will not differ from the usual treatment employed when these affections are situated in other parts of the body.

Venereal sores which may affect the integument of the eyelids are chancres, chancroids, and venereal ulcers. One would be naturally suspicious of the nature of an ulcer or sore on the eyelid in a patient known to be suffering from syphilis, or in one who had chancroids or sores known to be of venereal origin, located elsewhere. Even when symptoms of venereal disease do not exist elsewhere, venereal sores may exist on the eyelids. When patients present ulcerations of the integument of the eyelids which do not yield promptly to treatment, and which the microscope does not demonstrate to be malignant, our suspicions should be aroused at once as to their possible venereal origin.

Chancres of the integument of the eyelids are not so common as chancres of the conjunctiva, and we do not wish to be understood as intimating that they are commonly met with in the latter situation. They are, however, occasionally encountered in the integument of the eyelids, and are not always easily distinguished, macroscopically, from malignant diseases, especially epitheliomata. The diagnosis may have to be made with the microscope.

The treatment of venereal sores and ulcers will depend on whether their origin is syphilitic; but whether syphilitic or not, their treatment will differ radically from the treatment of malignant growths or neoplasms.

Syphilitic and venereal sores and ulcers of the eyelids will require the local and constitutional treatment commonly given this class of affections without regard to their situation. Malignant growths, on the other hand, will generally require operative treatment.

Herpes affecting the eyelids, oftener the upper, is not uncommon. We commonly meet with a mild form of herpes—fever sores as they are called—but we also meet with a severe form, the two differing so as almost to warrant describing them as different affections. We have herpes in the mild form, occurring as the result of febrile disturbances in children, occasionally also in adults. It may follow exposure to high winds, sunburn, and irritations of the skin generally. The herpetic eruptions from these causes affect all parts of the integument of the face indiscriminately, often both sides at the same time, including the eyelids. There appears a slightly elevated red spot, more or less rounded in outline, varying in size from 3 to 20 mm. in diameter, or even larger. This red spot tingles and burns, and in twenty-four hours begins to be vesicular in character, composed of a number of small vesicles. The fluid in these vesicles, which in the beginning is watery, soon becomes flocculent, changing into pus. The vesicles coalesce and break down, forming a scab. If this scab is removed we find the surface beneath ulcerated. Whether removed or not, the sore heals in a week or ten days, leaving a reddened surface, which may persist for a week or two weeks longer. Attacks of herpetic eruption such as this are of frequent occurrence in neurotic people, the result of some slight nervous irritation, or of direct irritation of the terminal endings of the sensory nerves. The course is mild, the treatment palliative, and the prognosis good.

We have another form of herpes, as we have said, known as herpes zoster, which affects the supra-orbital branch of the fifth nerve, generally unilateral, and often very serious in its consequences. Herpes zoster is ushered in with violent pain over the distribution of the nerve, producing intense supra-orbital neuralgia, which may last a day, or even two days, before the eruption takes place, and at times persisting during and after the eruptive period. The skin of the upper eyelid becomes reddened and swollen, and the lid itself œdematous. There is more or less marked febrile action. The eruption appears to be the same as that described in the simpler form of herpes, except that the underlying ulcers are deeper and frequently leave scars. The condition takes its name from the parts affected, as herpes zoster frontalis, herpes zoster palpebralis, and herpes zoster ophthalmicus. When it affects the eye itself (herpes zoster ophthalmicus) very serious results, even destruction of the eyeball, may follow.

The writer has seen several cases of herpes zoster affecting the eyelids and forehead which have been diagnosed by attending physicians who were not familiar with the disease as erysipelas, all coming from malarial districts.

The treatment consists of cathartics, hot applications to the affected parts to relieve the pain, and even opiates may be necessary. During the beginning of the eruptive stage, the intense irritation may be allayed by applications of weak solutions of acetate of lead, lead and opium wash, or carbolic acid. After the vesicular stage has passed, an ointment of carbolic acid and vaseline will soften the scabs and prevent, possibly, the formation of deep scars. In the writer's experience the best results have followed the internal administration of quinine.

Œdema of the eyelids is a symptom of importance in affections of the eye itself, as denoting the intensity of the exciting cause, which is generally of an inflammatory nature. Œdema may occur in the eyelids also because of disease of organs remote from the eye, as in cardiac and renal disease, and in anæmia.

When due to local causes situated in the eye or adjacent structures, the amount of the œdema will generally be in proportion to the intensity of the disease which produces it, as well as to the location of the affection. For example, we frequently find in iritis, both primary